BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

IN RE: APPLICATION 96-1	)	
	)	
of	)	**EXHIBIT NO. KDN-T**
	)	
OLYMPIC PIPELINE COMPANY	)	
	)	
CROSS-CASCADE PIPELINE PROJECT	)	
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PREFILED DIRECT TESTIMONY OF:	**KURT D. NELSON**
ISSUES:	**WEST-SIDE STREAM CROSSINGS, FISHERIES, AND AQUATIC RESOURCES IMPACT ASSESMENT REVIEW**
SPONSOR:	**THE TULALIP TRIBES**

Q: ***Please introduce yourself and state your qualifications to the Council.***

A: My name is Kurt David Nelson. I am employed by the Tulalip Tribes as a Fish and Water Resources Scientist. I am a staff member within the Tulalip Tribes Department of Environment, which is charged with managing, enhancing and protecting tribal treaty fishing rights. My business addresss is 7615 Totem Beach Road, Marysville, Washington 98271.

Q: ***Please generally identify the nature and subject of your testimony.***

A: My testimony will focus on the fish and fish habitat present within streams crossed by Olympic Pipeline Company's ("Olympic") proposed Cross-Cascade Pipeline project (EFSEC Application No. 96-1) within the Snoqualmie Basin. I will discuss the impacts that will or could occur to fish and fish habitat as a result of construction and operation of the proposed project. To discuss these impacts thoroughly, I adopt my technical report (**Exh. KND-1**, including attachments) by reference into this testimony. In my testimony below I summarize my opinions and conclusions as contained in that report, but a more complete analysis will be found in the report itself and in the references and materials cited therein.

Q: ***Please describe the Tulalip Tribes' usual and accustomed fishing areas ("U&A") for purposes of your testimony today.***

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A: Please refer to the prefiled direct testimony of Terry R. Williams for a more thorough response. Briefly, The Tulalip Tribes' ("Tribes") U&A includes (but is not limited to) all freshwater areas and riparian zones within the Snohomish River / Snoqualmie River Basin. Please note that, except where otherwise indicated, my testimony in this case only addresses fishery and habitat issues within this Basin. Any discussion of the impact of the pipeline proposal on the Tribes' marine U&A, or in other fishery areas, is beyond the scope of my testimony today.

Q: Please identify the bases for the opinions you express in this testimony.

A: Please refer to the reference section appended to my technical report ("West-Side Stream Crossings, Fisheries and Aquatic Resources Impact Assessment Review"), prepared by me and attached as **Exhibit KDN-1** to this testimony. There you will find specific references to scientific literature which, together with my direct knowledge of the fishery in the Snoqualmie Basin, represent the bases for my testimony. In preparing my testimony, I also relied on the joint technical reports to be filed before EFSEC in this case.

Q: Please identify any areas of scientific uncertainty or contradiction which may bear on your testimony in these proceedings.

A: Olympic provides very limited information on many subjects, including (without limitation) construction design at stream crossings, local site conditions, mitigation plans, monitoring plans, fish and aquatic resources present at and near the crossing locations, and the sensitivity of those resources. Given this lack of information, I have made certain informed assumptions concerning site conditions and the presence or absence of fish and aquatic resources. My assumptions are based on information contained in the scientific literature referenced in my technical report **(Exh. KDN-1, References Section)**, my personal knowledge of the Basin, and my professional education and experience. Among the areas of specific uncertainty due to lack of project information and lack of information concerning the presence of natural resources are:

- Lack of construction detail and physical impacts to stream habitat and fish from construction at stream crossings (for example, it is uncertain whether the crossing can be constructed as depicted for the Tolt River (26) crossing due lack of detail on stream size, channel depth, and angle of flow (**Exh. KDN-1, § 4.02, at 11-12)**;
- Lack of necessary information on site conditions, (e.g., slope of valley walls, bed control points, channel and valley topography), design (e.g. trench depth), and resources present (i.e., fish utilization is unknown in 58 of the first 83 stream crossings) to determine pipeline construction impacts **(id. § 4.02, at 12)**;
- Lack of accurate or consistent description of presence of fish and aquatic resources at many proposed stream crossings (i.e., at some crossings fisheries utilization is alternately described as "unknown" and "no fish" without explanation or additional information) (**id. § 4.02 at p. 12**);
- Lack of detail on construction methods, mitigation measures, or existing site conditions (i.e., whether and how staging areas in unique crossing sites or sensitive areas can or will be restricted to 60 feet, or extent of concrete pipeline coating in wide floodplains such as the Snoqualmie River floodplain; extent of new roads for access, hydrostatic testing procedures and discharges, steep slope

construction data, and the frequency, type, qualifications, performance standards, training, or oversight of monitoring) (**id. § 4.03, at 12)**;

- Weaknesses in the Revised Application's "stream sensitivity analysis" which may lead to questionable conclusions regarding impact (**id. § 4.12, at 16**);
- Assumptions regarding the scope of areas impacted by construction (**id. § 4.11, at 15);**
- And other data gaps in the Revised Application, including (without limitation) incomplete scientific information concerning cumulative impacts (**id. § 3.02 at 7**); mass wasting events and potential (**id. § 3.03 at 8**); scour and lateral migration (**id. § 3.04 at 9**); processes within the hyporheic zone (**id. § 3.05 at 10**); under-culvert pipeline crossing detail (**id. § 4.01 at 11**); fish and aquatic resource presence during construction (**id. § 4.04 at 13**); lack of information concerning and impacts of bedload transport (**id. § 4.05 at 13**); lack of detail concerning turbidity levels during and after construction (**id. § 4.06 at 14**); lack of information concerning fish impacts from removal of vegetation (**id. § 4.07 at 14**); construction methodology and resource impacts from stream widening (**id. § 4.08 at 15**); condition of crossing culverts (**id. § 4.09 at 15**); possible blasting and acoustic shock (**id. § 4.10 at 15**); acute and chronic toxicological impacts of product release to fish and habitat (**id. § 5.03 at 19**); and potential effects on fish from proposed cathodic protection (**id. § 5.07 at 22**).

Q: Please identify any demonstrative or documentary evidence on which you intend to rely in the presentation of your testimony.

A: Please see the exhibits to my testimony, which include my technical report entitled West-Side Stream Crossings, Fisheries, and Aquatic Resources Impact Assessment Review (**Exh. KDN-1),** my resume (**Exh. KDN-2)**, and photographs and narrative depicting typical geologic features and processes at work in Pacific Northwest streams (**Exh. KDN-3**). The photos may be reproduced as slides and presented during my testimony at the adjudicative hearings, using the narrative provided. Also, other charts and maps may be used during the hearings for illustrative purposes.

Q: If in your testimony you use any technical or scientific terms that are not easily understandable by lay persons, please identify and define those terms here.

A: **Redds**: Fish nests made in gravel consisting of a depression hydraulically dug by a fish for egg deposition and then filled, together with associated gravel mounds.

Snoqualmie River Basin: Total land area of eastern Snohomish and King Counties that drains water, sediment, organinc matter, and dissolved materials to a common outlet, the outlet of the Snoqualmie at its confluence with the Skykomish River.

Snohomish River Basin: Total land area of eastern Snohomish and King Counties that drains water, sediment, organinc matter, and dissolved materials to a common outlet, the mouth of the Snohomish, at Everett. The Snoqualmie is contained within the Snohomish River Basin.

Anadromous: Fish that move from sea to freshwater for reproduction.

Spawning: The reproductive act by fish. For salmon it is the act of locating and digging a nest, and depositing and fertilizing the eggs.

Escapement: That portion of an anadromous fish population that escapes the commercial and recreational fisheries and reaches the freshwater spawning grounds.

Holding: Locations within a river or stream where adult salmon will remain prior to spawning.

Rearing: In the context of this testimony, it refers to locations within rivers or streams that salmon and trout juveniles prefer to remain and grow. Also refers to a period within the juvenile salmon life stage, a period of rapid growth.

Debris torrents: Deluge of water charged with soil, rock, and organic debris down a steep stream channel.

Mass wasting: Downslope transport of soil and rock due to gravitational stress.

Stream scour: The removal of material from a streambed by flowing water.

Channel migration: The lateral movement of a stream channel across a valley floor over time.

Riparian: Area with distinct soils and vegetation between a stream or other body of water and the adjacent upland. It includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riparian vegetation: Vegetation growing on or near the banks of a stream or other body of water in soils that exhibit some wetness characteristics during some portion of the growing season.

Alluvium: Material deposited by running water, including the sediments laid down in riverbeds, floodplains, lakes, and estuaries.

Best Management Practices (BMP's): Are actions or measures voluntarily applied or required by law to decrease the impact of a land management action on a resource.

Bedload: Sediment moving on or near the steambed.

Sediment load: The total amount of sediment moved in a stream by running water.

Bedload transport: The act of or mechanics of moving sediment.

Turbidity: Water containing suspended organic and inorganic particles, causing cloudiness.

Alevin: Larval salmon that has hatched but has not fully absorbed its yolk sac, and generally has not yet emerged from the spawning gravel.

Fry: Life stage of trout and salmon between full absorption of the yolk sac and fingerling or parr stage, which generally is reached by the end of the first summer.

Juvenile: An immature salmon or trout.

Macro-invertebrates: Invertebrates large enough to be seen with the naked eye (e.g., most aquatic insects, snails, and amphipods).

Aquatic invertebrates: Invertebrates found in aquatic systems.

Avulsions: A shift in the course of a stream.

Q: ***Please describe the Project location as it relates to the Tulalip Tribes U&A.***

A: The Tribes' U&A, more thoroughly described in Terry R. Williams' prefiled direct testimony, includes (without limitation) all freshwater and riparian areas in the Snohomish / Snoqualmie Basin, all of which is located west of Snoqualmie Pass in the Cascade Mountain range in Washington state. My opinions and conclusions in these proceedings relate solely to fish and habitat impacts and information associated with the Cross-Cascade pipeline proposal's route in this Basin, unless indicated otherwise.

Of the 57 miles of pipeline to be located in western Washington, 53 miles will be located in this Basin. The pipeline will have and impact on approximately 84 streams and 45 wetlands. Stream crossing methods are invasive trenching (30), crossing above and below culverts (44), and the use of bridged crossings (10). **Exh. KDN-1 § 1, at 2**.

Q: ***What impacts to fishery resources are identified by Olympic in the construction, operation and maintenance of this pipeline project?***

A: Olympic concludes: 1) that the primary impacts to fishery resources from pipeline installation and associated construction will be to water quality (sedimentation) and physical alteration of in-stream and stream adjacent habitat; 2) that construction impacts will be minimal and short term as long as the proposed mitigation measures are implemented; and 3) that operation and maintenance activities should have <u>no</u> impacts on fish and aquatic resources as long as the proposed mitigation measures are implemented. **Exh. KDN-1 § 1, at 2**.

Q: ***What factors influence the level of environmental impact to fish habitat at Olympic's pipeline stream crossings?***

A: The level of impact to fish and fish habitat at a stream crossing is directly related to: 1) the crossing method; 2) site conditions; 3) the fish and aquatic resources present and their sensitivity; 4) the mitigation measures that are applied, and how successfully they are applied; and 5) the future flow, sediment, and riparian conditions at the crossing and within the drainage network upstream of the crossing.

Q: ***What errors, omissions or other problems do you perceive in connection with Olympic's Site Certification Application, relating to fish and habitat?***

A: Olympic's proposal provides an inadequate review of the presence and sensitivity of fish and aquatic resources and site conditions at stream crossings, and the impacts that may arise from pipeline construction and operation. The Revised Application does not provide the necessary detail concerning the resources and site condition present at stream crossings to meaningfully evaluate project impacts (**Exh. KDN-1, § 4.02**). It overlooks informational resources and provides an insufficient review of existing resources (**id. § 2**). It does not present a complete picture of the potential types, severity, or magnitude of impacts to fish and habitat (**id.**). Potential impacts to fish and aquatic resources are discussed in several sections of the Revised Application, making it difficult to review, but more importantly the organization of the document splits up the assessment of impacts so that each are evaluated independently, indirectly minimizing the level of impact to a resource.

Additional information on the distribution of fish resources and habitat preferences is provided to EFSEC in **Exh. KDN-1, § 2.** Had Olympic used these data sources, it would have presented a more complete picture of local site conditions and the salmon species present at stream crossing locations. This information would have been helpful in determining project impact and pipeline siting. For example, using these literature sources Olympic would have disclosed (1) that Griffin Creek is one of, <u>if not the most important</u>, coho producing area within the Snohomish watershed. **Exh. KDN-1, § 2.01 at 2.** Within the Snoqualmie River system between 1984 and 1992, Griffin Creek escapement ranged from 29% to 43% of the total escapement to the Snoqualmie River; (2) that Cherry Creek (stream crossing 20) is a primary spawning area for steelhead; and (3) that the lower 6 miles of the Tolt River is one of two primary spawning areas for chinook, pink, and steelhead in the Snoqualmie watershed. **Id. at 2-3.**

Further, Olympic does not identify the use of the Snoqualmie River system by Dolly Varden or Bull trout - endangered fish. Their presence is suspected (but not confirmed) at Griffin Creek and other locations. **Id. at 3.**

Olympic does not adequately address the potentially significant threat to fish and habitat from mass wasting events caused by pipeline construction and during operation of the pipeline. Section 3.4 of the Revised Application provides very little discussion of impacts to fish and aquatic resources from mass wasting activities. Mass wasting is common to the forested slopes of the Pacific Northwest. The types of mass wasting include shallow-rapid landslides, debris torrents, large persistent deep-seated failures, and small sporadic deep-seated failures. **Exh. KDN-1, § 3.03 at 8**.

Debris torrents originating naturally or the result of land use activities (e.g., logging) upstream of the pipeline have not been assessed. These physical processes can expose the buried pipeline to hydraulic and abrasive forces potentially resulting in a leak or rupture. Many of the tributaries to the South Fork Snoqualmie are susceptible to debris torrents (i.e. Hall, Harris, Carter). These streams are susceptible to bed scour in the steeper locations and to lateral channel migrations and incision in locations of lower slope. **Exh. KDN-3**. Deep-seated failures crossed by the pipeline pose unacceptable risk to fish and aquatic resources. These landscape features are capable of delivering thousands of cubic yards of sediment to stream channels if disturbed. Large deep-seated landslides like those present at the Cherry Creek crossing (20), the Tolt River (27), and the South Fork Snoqualmie (Crossings 59 – 61), are in similar terrain (i.e. glacial) to landslides that have occurred elsewhere in the Puget Sound Region **Exh. KDN-3**. In addition to the deep-seated failures identified by Olympic the Griffin/Tokul Watershed Analysis (1995) identified both deep-seated and shallow-rapid landslides in the vicinity of the proposed pipeline crossing. Pipeline construction on these deep-seated failures can alter drainage patterns destabilizing them or increasing their activity. **Exh. KDN-1, § 3.03 at 8** Mass wasting along the pipeline route is a natural threat to fish resources that has not been properly assessed. Increased activity of landslides can deliver significant amounts of sediment to a stream or river causing significant channel changes. Landslides often occur catastrophically. These deep-seated landslides have been attributed to a decrease in salmon in the Tolt River. The construction and operation of a pipeline through areas prone to deep-seated landslides and debris flows (e.g., tributaries to the S.F. Snoqualmie) pose a threat to the pipeline and fish resources. **Exh. KDN-1, § 3.03 at 8**.

Stream scour and lateral migration - not addressed in the Revised Application - present a risk to the operation of the pipeline and threat to fish and aquatic resources if a rupture or leak occurs. Both stream scour and lateral migration are geomorphological processes that commonly occur in streams in western Washington **Exh. KDN-3**. Stream scour and lateral migration have the capability of exposing a buried pipe to hydraulic and abrasive forces potentially causing a rupture and or leak (**DEIS p. 3-19**). Scour and lateral migration occur during the wet months during high water events. The impacts from scour and lateral migration present a threat to fish and aquatic resources that have not been adequately addressed. Lateral migration and channel avulsion is particularly active process on alluvial fans (e.g. S.F. Snoqualmie tributaries) and in some channels that occupy broad floodplains (e.g. Tolt River, upper Snoqualmie). Olympic provides no discussion on the potential impacts to fish resources from a spill caused by scour or lateral migration in the Fisheries Section of the Revised Application. Lateral migration can occur progressively or catastrophically (e.g., channel avulsion). Channel migration can be accelerated by natural or man made changes that constrict or deflect flow toward the migration direction. It can also be accelerated thorough increases in stream flow, increases in sediment supply, and the removal of riparian vegetation. Stream scour and lateral migration are processes that occur during the wet season (i.e. October – March). It is during this time that the pipeline is at greatest risk of spill from geohazards. This is

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also the season that salmon are present in their greatest numbers. For instance, in Griffin Creek during November through January, when rain fall and stream flow are the highest, adult coho, eggs, and juveniles from the previous year would all be present. Also present are yearling and subyearling steelhead and several age classes of cutthroat trout. A spill caused by lateral migration damage to the pipeline could potentially destroy or seriously impact all three species. **Exh. KDN-1, § 3.04 at 9**.

The scour evaluation used by Olympic to determine scour depth is also deficient. As stated in the **DEIS (p. 3-34**), "The level of investigation proposed by OPL to evaluate scour and lateral migration potential at most stream crossings would not be adequate to determine sufficiently conservative burial depths for the pipeline…." Determination of scour depth is critical to the protection of the pipeline and protection of fish and aquatic resources. Scour depth would have to be determined not only in the present day channel but also across the full width of any floodplain that could experience lateral migration **(DEIS p. 3-34)**. Stream crossings between the Thrasher Pump Station and mile post 8 (lower Snoqualmie River) will be particularly susceptible to increased scour as the area is urbanizes over the next 50 years. The loss of temporary bed control points immediately downstream of a crossing can lead to increased scour at the pipeline crossing. For example, a log jam now located 20 meters downstream of the proposed Cherry Creek crossing is controlling the bed elevation at this crossing. Stream crossings on many of the S.F. Snoqualmie tributaries occur on alluvial fans that are highly unstable and are susceptible to scour and lateral migration over the next 50 years. In the scour evaluation screening procedure used by Olympic, only 11 streams were identified where additional scour investigation is needed, and only 1 of these is in western Washington - a region known for the dynamic nature of its streams and river channels.

The Revised Application and associated reports are not organized in a manner to meaningfully evaluate project mitigation or impacts. Assessment of impacts are evaluated independently, indirectly minimizing the level of impact to a resource. **KDN-1, § 3**.

Olympic evaluated stream crossing conditions and the presence of fish and aquatic resources using databases and maps that do not describe local or site specific physical conditions. Olympic used DNR stream typing data as one source to determine presence and absence of fish, but studies show that this database greatly underestimates fish use in the Snoqualmie Basin. **Id. § 3.01 at 6**. Also, Olympic's habitat surveys are described qualitatively and some significant fish-bearing streams were not field-surveyed, resulting in an incomplete (and in some cases inaccurate) assessment of local conditions. Some stream crossing sites were assessed simply by reference to other, ostensibly similar crossings (e.g., Humpback Creek, Little Bear Creek), alternate sites different from the stream crossing sites were assessed with the assumption the stream was the same at the crossing (e.g., Humpback Creek, Little Bear Creek). Habitat surveys were only conducted on 24 of 83 stream crossings between Thrashers Corner and Snoqualmie Pass. According to the Revised Application, fish surveys were conducted in 1996 and 1997 but no field data were provided. **RA page 3.4-58**. Fish utilization is unknown in 58 of the first 83 stream crossings, according to Olympic's Fisheries and Aquatic Resources Report. **Exh. KDN-1, § 4.02 at 12.**

Q: ***Please describe the relationship between the health of aquatic habitat in the Basin, and the health of the fishery in that Basin.***

A: The health of the salmon resource in the Basin is directly related to the health of the habitat they utilize. Without freshwater habitat for spawning and rearing, salmon production will decline. Salmon and trout require the following habitat conditions: (1) an adequate supply of clean water, (2) and ample food supply, (3) a sufficient amount of spawning and rearing habitat, and (4) access to habitat. **Exh. KDN-1 § 2.02 at 4.**

Q: ***Please give your opinion as to anticipated impacts to fish and fish habitat from project-related <u>construction</u> at western Washington stream crossings.***

A: Of 84 pipeline stream crossings in western Washington, 30 will be invasive crossings. Of the 30 invasive stream crossings, more than half provide fish habitat at the crossing or just downstream of the crossing. In addition, eight wetlands will be invasively crossed. Fish utilization of wetlands was not determined. These numbers also do not include unidentified stream crossings of which there are five or more, nor do they include culverted stream crossings where culverts will be replaced. Construction impacts to fish resources could vary from <u>minor to major</u> depending on the species present, the life stage and numbers present, and the portion of the population present relative to the entire population. For example, if a significant number of spawning salmon are affected by pipeline construction, and that spawning population represents a large percentage of the population as a whole, impacts to the entire population could be serious. **Exh. KDN-1 § 4 at 11.**

Under-culvert pipeline crossings are not adequately discussed in the Revised Application. Olympic considers this type of stream crossing to be noninvasive, which is misleading. Increased sedimentation and dewatering from under-culvert crossings can lead to spawning and rearing mortality and reduced rearing area. **Id. § 4.01 at 11.**

In sum, construction impacts to fish and habitat can be minor to major, depending on the additional project information needed as described above. The Revised Application does not provide sufficient detail as to construction methods, fish utilization, culvert analysis, wetland impacts, scour evaluation, mass wasting information to more precisely determine project impacts to fish and habitat.

Q: Do the proposed general construction windows eliminate impacts to fish/habitat?

A: Certainly not. The general construction windows are established by WDFW in an attempt to reduce construction impacts on some targeted fish resources. At all crossings where fish occur, they will be present during construction. In fact, the construction window of June 15 to October 15 identified for Snohomish and King Counties will not avoid chinook spawning and chinook holding (i.e., Tolt River). Chinook and pinks salmon spawn in the Tolt River between mid-September through October. In addition, adults hold in pools in the Tolt River before mid-September. Steelhead spawning occurs into June, with fry still emerging in August. At the Cherry Creek crossing, coho fry, steelhead eggs or fry, and one year old steelhead juveniles will be present during the construction

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window, along with several different ages of cutthroat trout and nonsalmonids. Construction windows do not eliminate impacts, or even reduce impacts to certain fish. **Exh. KDN-1 § 4.04 at 13 and Attachment 2**.

Q: ***Will the construction activities described in the Revised Application result in increased sedimentation?***

A: Yes. The Revised Application states that "[c]onstruction methodologies used for the Cross Cascade Pipeline Project should produce no increases in bedload transport, but will release varying amounts of suspended sediment." This means that pipeline construction will result in <u>increased sediment loading</u> to surface waters crossed or adjacent to the pipeline corridor. Construction of the pipeline will result in increased sediment loading to surface waters crossed or adjacent to the pipeline corridor. Sources of the sediment will include in-channel trenching, surface runoff from the construction corridor, in particular areas of high surface erosion and mass wasting potential. Overall sediment delivery to streams will be <u>minor to major</u> depending on site conditions, construction methods and timing, and mitigation measures implemented, and maintenance of mitigation measures. The duration of the impact will vary but could be long term if pipeline construction exacerbates mass wasting activity, or mitigation measures do not perform as designed, or significant channel erosion and / or lateral migration occur. Construction could also significantly alter the channel, degrading fish habitat, if construction exacerbates mass wasting activity or if significant channel erosion and / or lateral migration occur. **Exh. KDN-1 § 4.05 at 14**.

The high suspended sediment levels or turbidity that can be expected from construction will probably be in the range of 2,000 to 3,000 mg/l (**Revised Application ("RA") p. 3.4-101**). These levels can lead to juvenile mortality, but more likely will result in avoidance behavior or reduced growth. The construction will occur during a period where the rapid growth of juvenile salmon is critical, which may determine survival later in life.

Impacts to fish and habitat from removal of vegetation will be <u>minor to major</u>, depending on crossing types, location and methodology. Tree removal will occur at all invasive stream crossings. The loss of trees within the riparian zone will have a wide variety of impacts, including higher stream temperature, reduction in bank stability, the loss of overhead cover, a reduction in small organic matter, a reduction in terrestrial insects, and the loss of large woody debris recruitment. The loss of trees from the riparian zone and the continued loss of trees from the riparian zone (as in the BPA utility corridor) will result in a reduction in habitat quality and reduced salmonid production **Exh. KDN-3**. For example, if a removal of riparian vegetation results in channel widening or channel avulsions, major impacts to fish and aquatic resources could occur. If a stream has naturally high stream temperatures (i.e. 18 degrees C), a decrease in shading may locally increase temperatures to stressful levels, resulting in lower quality habitat and a lowered salmonid production. The permanent loss of trees from the riparian zone is a long term impact. **Exh. KDN-1 § 4.07 at 14**.

Removal of riparian vegetation and the large woody debris it provides will reduce the availability of a critical component to streams. There is no other structural element as

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important to salmonid habitat in Pacific Northwest streams as large woody debris. Based on my experience performing habitat surveys in streams in the Puget Sound region, salmon streams frequently have too few pieces of large woody debris in-channel, and the addition of more large woody debris over time is unlikely because land management activities have removed recruitable trees from the riparian corridor. The loss of trees through pipeline construction will add to this region-wide problem. Recent restoration projects implemented by the Tulalip Tribes have focused on replacing large woody debris. Recently, the Tulalip Tribes and others spent over $400,000 to build artificial log jams in the Stillaguamish River to enhance chinook habitat. **Id**.

In my opinion, construction and maintenance of the pipeline will contribute to stream widening and other forms of long term degradation at some crossing sites. It is extremely unrealistic to assume that with the bank instability noted at several crossings (e.g., South Fork Snoqualmie tributaries), the presence of mass wasting features, the removal of riparian vegetation, and the tendency for lateral migration at moderately confined to unconfined crossings, that construction and maintenance activities will not contribute to stream widening at some crossings. Stream widening, in most cases, results in a decrease in pool frequency, depth, and cover important elements of fish habitat. Olympic suggests monitoring as a mitigation measure to catch the problem before it gets too severe. However, monitoring as a mitigation measure does not take into account that bank erosion can occur quickly, or catastrophically. **Exh. KDN-1 § 4.08 at 15**. Olympic also does not indicate how monitoring will be effective to rectify the negative effects of lateral migration and / or stream widening, should they actually occur.

The impact to fish and aquatic habitat from roads (road construction, existing road erosion) is uncertain. Olympic did not evaluate the condition of roads along BPA corridors even though it acknowledges that "numerous roads ... follow the corridor." **RA at p. 3.4-58**. Forest and rangeland roads can cause serious degradation to salmonid habitat. Even higher levels of surface erosion and mass wasting can be expected from poorly maintained roads or low standard roads. A significant amount of surface erosion was observed at the Cherry Creek crossing (20) from the access road on the north side. Drainage from the road on the south side of the crossing may contribute to slope instability on the south side. **Id**.

Culvert failure at stream crossings can be a major source of increased sediment loading to streams. When stream crossings fail, they do so catastrophically - causing local scour and deposition and additional erosion down stream. EFSEC must require a thorough culvert evaluation (i.e. culvert condition, fish passage, water conveyance) and implement its recommendations prior to project approval. **Exh. KDN-1 § 4.09 at 15**.

Q: What effect will in-water blasting during pipeline construction have on salmon resources?

A: Construction impacts to salmon at some crossings from in-water blasting could occur. Apparently Olympic does not propose to use in-water blasting. **RA p. 3.4-105.** However, it is probable that construction within some areas in or near streams may require blasting. Sites within the Snoqualmie watershed where blasting may be necessary include Peoples Creek (15), and some S.F. Snoqualmie tributaries (e.g., Olallie Creek or

Humpback Creek), where the depth of alluvium or colluvium may be shallow. In steep locations adjacent to streams, blasting may destabilize colluvium, which may lead to shallow landslides at the time of the blast or later. Olympic does not describe the types of measures that will be implemented to reduce this threat. **Exh. KDN-1 § 4.10 at 15**.

Q: ***Does the Revised Application adequately evaluate the fish and habitat areas that may be affected by construction activities?***

A: No. The Revised Application does not attempt to estimate the total stream area impacted by construction. Such areas are either understated or unknown. Wetland areas frequently provide high quality rearing habitat. Impacts to fish and fish habitat in the wetlands that will be invasively crossed is unknown. At least 5 additional stream crossings are present that were not identified. They include two crossings between mile posts 8 and 9; two crossings between mile posts 24 and 25; and one crossing between mile posts 20 and 21. **Exh. KDN-1 § 4.11 at 115.**

Using information provided by Olympic as well as my own observations, a very conservative estimate of stream area impacted by construction can be calculated. The potential direct stream impact (areas physically disturbed by construction activities) will exceed 21,300 square feet. Acknowledging that some habitat degradation (e.g., pool filling, reduced macro-invertebrate densities, reduced spawning) from sedimentation will occur within 1000 feet downstream of the pipeline crossing, (**RA at 3.4-112**), the amount of additional stream habitat degraded by sedimentation will be in excess of 250,000 square feet (based on widths used by Olympic and my observations of stream width).

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When combined with the potential direct impact of 21,300 square feet, the combined area degraded encompasses over 271,000 square feet of stream channel in western Washington alone. This amount is probably very conservative since it does not include wetland habitat, unidentified crossings, or sedimentation impacts from construction under culverts. Together, these represent a significant impact to fish resources in western Washington. **Exh. KDN-1 § 4.11 at 15**.

Q: Are there any unique or problematic stream crossings identified in the Revised Application for which there is inadequate detail to assess fish or fish habitat impacts?

A: Yes. Stream crossings at Cherry Creek, Tolt River, Griffin Creek, and several tributaries to the South Fork Snoqualmie present unique crossing problems. The unique conditions in these streams include adjacent mass wasting failures and susceptibility to debris torrents. Important information has been omitted which could describe crossing conditions at some of the listed crossings. For example, a deep-seated failure is located on the south bank of the Tolt River, but is not described in the Revised Application. **Exh. KDN-1 § 3.03 at 8**.

Q: Will pipeline construction activities in the streambed and in riparian areas result in increased sedimentation and bedload transport? If so, what do these increases mean in terms of impact to habitat and direct impacts to fisheries resources?

A: Please see the discussion of sedimentation impacts on the previous page. Generally, pipeline construction as described in the Revised Application will result in increased sedimentation and bedload transport at and downstream of each of the designated stream crossings. Impacts to fish and habitat from sedimentation caused by construction could be minor to major depending, among other things, on the size and distribution of the fish or habitat resource within the watershed. For example, if the pipeline crossing is located upstream of a high quality spawning area, and the spawning population represents a significant percentage of the population as a whole, construction-related sedimentation impacts to the entire population would be significant (e.g., chinook, coho). **Exh. KDN-1 § 2.02.03 at 5; id. § 4 at 11.**

Depending on turbidity levels, acute mortality to rearing juveniles and holding adults directly attributable to suspended sediment levels is possible. However, stress and avoidance are two other responses that are highly likely under any in-stream construction scenario. Since the Revised Application does not discuss removal of fish from the crossing locations prior to construction, mortality of adult and juvenile salmon and trout directly resulting from construction activity is highly probable. **Exh. KDN-1 § 2.02.02 at 4**.

Below I will summarize my opinions concerning construction impacts to salmon and steelhead from increased sedimentation (see generally **Exh. KDN-1 § 4**):

- Mortality. Acute mortality to juvenile fry may occur where suspended sediment concentrations exceed 1000 mg/l. **Exh. KDN-1 § 2.02.02 at 4**. Also, returning adult salmon experiencing increased stress during migration or delays can increase the utilization of energy stores leading to mortality prior to spawning, or reduced fecundity. **Exh. KDN-1 § 2.02.01 at 4.**

- Adult migration. Migrating salmonids (e.g., chinook, pink salmon) avoid water with high silt loads, and cease their migration when such loads are unavoidable. These avoidance responses can result in lower production within the stream system. **Exh. KDN-1 § 2.02.01 at 4**.
- Juvenile Rearing. High turbidity levels caused by construction will reduce the amount of juvenile rearing habitat at and downstream of stream crossings. Steelhead trout and coho salmon exhibit higher emigration rates in turbid streams. These avoidance responses result in potentially lower production at the crossing and downstream of the crossing. Newly emerged fry appear to be more sensitive to turbidity then older juveniles. Reduced growth is also a response to higher turbidity levels. Construction during late summer resulting in increased turbidity can decrease feeding efficiency and reduce macro-invertebrate production for 2-3 months or longer, resulting in a reduction in juvenile growth which may determine whether juvenile trout or coho survive over for the winter. Since mass wasting features and high erosion potential are present at a number of stream crossings, the addition of excessive amounts of large sediment is a serious possibility, along with loss of rearing habitat that can occur from pool filling. **Exh. KDN-1 § 2.02.02 at 4**.
- Spawning. Increased fine sediment from construction activities reduce spawning success by deposition in spawning gravels. Increased fine sediment in spawning areas can also reduce survival of eggs by impeding the movement of water through spawning sediments or preventing alevins from emerging from the

streambed. During incubation, water must circulate around the eggs to provide oxygen and remove metabolic waste. Impacts from construction will depend on site conditions, the success of the anticipated mitigation measures, and the subsequent flows. I cannot agree with Olympic's broad conclusion that "impacts will be short-term", since it ignores local site conditions, construction methods, and the sensitivity of resources present. I also cannot agree with Olympic's conclusion (**RA 3.4-102**) which states: "by properly timing construction the release of sediment will not reduce reproductive success." Olympic apparently fails to take into consideration that avoidance response can concentrate more fish into a smaller area, leading to lower egg-to-fry survival. Olympic also fails to fails to indicate that chinook, coho, pink, and chum spawning occurs in the fall, during and shortly after the proposed construction window. Depending on stream flow, the generation of fines could seriously affect spawning location and success. Winter and spring freshets that remove fines usually occur after chinook and pink spawning and may not occur until November and December when coho and chum are spawning. **Exh. KDN-1 § 2.02.03 at 5**.

- <u>Construction Impacts - Conclusions</u>. Habitat degradation will vary from <u>minor to major</u>. Short term degradation should be expected at most if not all trenched and under culvert crossings. Long term impacts should be expected at some of the crossings. Construction related habitat degradation will principally be from sedimentation, but will also be caused by the removal or degradation of in-channel and stream bank features (e.g., trees, undercut banks) which provide, cover, temperature regulation, food, and rearing space.

Q: ***Please describe the mass wasting potential along the pipeline route, and its implications for fish and habitat.***

A: Mass wasting along the pipeline route poses a significant threat to fish and aquatic resources. Increased landslide activity can deliver significant sediment loads to a stream or river system. Large landslides like those already present adjacent to Cherry Creek, Tolt River, and Griffin Creek are in similar terrain (i.e. glacial) where large landslides have a tendency to occur. Large deep-seated landslides account for a significant amount of sediment load to the Stillaguamish Watershed, an areas with similar terrain. For example, a massive slide at Deforest Creek in 1984 resulted in channel widening, loss of pools and pool depth, and a decrease in steelhead production in Deer Creek. By itself, the Deforest Creek slide doubled the sediment loads to the entire Stillaguamish River. Landslides often occur catastrophically. These deep-seated landslides have contributed to decreased salmon production in the Stillaguamish River, and are a limiting factor in fish production in the Tolt River. The construction and operation of a pipeline through areas prone to deep-seated landslides and debris torrents (e.g., tributaries to the S.F. Snoqualmie) pose a threat to the pipeline and, consequently, to fish and aquatic resources. **Exh. KDN-1 § 3.03 at 8**.

Q: ***What is the "Aquatic Conservation Strategy" identified in the Revised Application? Is the Cross-Cascade proposal consistent with its objectives?***

A: The Aquatic Conservation Strategy identified by Olympic in the Revised Application is a strategy, developed by federal agencies, aimed at restoring and maintaining the ecological health of watersheds. Many features of the Olympic Pipeline project do not comply with the objectives and components of the Aquatic Conservation Strategy, and will in fact make achieving its objectives more difficult. As a preliminary matter, the Strategy is not limited to aquatic systems utilized by anadromous salmonids, as the Revised Application suggests. Contrary to the objectives of the Strategy, the project:

- Will merely maintain or reduce the diversity and complexity of riparian and in-channel habitat;
- Will merely maintain or decrease the physical integrity of the aquatic system;
- Will decrease water quality necessary to support aquatic and wetland systems;
- Will not maintain and restore patterns of sediment, nutrient, and wood routing, and
- Will not maintain and restore species composition and structural integrity of riparian areas.

Exh. KDN-1 § 4.14 at 16.

Q: ***Please describe Olympic's conclusions as to impacts to fish and habitat from pipeline operation and maintenance.***

A: Olympic's conclusions are premised on spill risk data and Olympic's "Product Spill Analysis", both of which have been widely criticized. For example, Olympic states that a product spill would be "either short in duration, small in volume, or both." Olympic's assumptions supporting these conclusions are that: 1) response time will be swift; 2) containment, recovery and cleanup/disposal will occur quickly; 3) most of the spilled product will be removed from the environment; 4) the area impacted will be relatively small; 5) the time of exposure of resources to spilled product will be limited; and 6) most of the route is located in upland areas. **RA at p. 3.4-103**; **Exh. KDN-1 § 5.01 at 17-18**. I cannot agree with Olympic's assumptions or its conclusions. First, the pipeline is at greatest risk of failure at remote and geomorphologically active stream crossings and sensitive areas. **Exh. KDN-1 § 3.01 at 6.** Visual detection and containment will be difficult in such areas, and even moreso in winter or storm conditions. Second, the area of impact may not be small, as acknowledged in Olympic's own product spill scenarios (i.e. Product Spill Analysis, Scenarios 2 through 6). The scenarios in the Snoqualmie drainage are not short in duration (e.g., Harris Creek; moderate to long term), relatively small in area (e.g., Harris Creek - 4 miles), or small in volume. **Exh. KDN-1 § 5.01 at 18**.

Q: Please give your opinion of the effectiveness of Olympic's spill prevention measures in relation to impacts to fish and aquatic resources from pipeline operation and maintenance.

A: Olympic's proposed spill prevention and control measures are insufficient to protect fish and habitat. Olympic's spill prevention measures rely on a leak detection system and visual reconnaissance. The leak detection system as proposed cannot reliably detect leaks of less than 1% of average pipeline flow (**RA page 2.9-20**), which amounts to 25,200 gal/day at the pipeline's initial capacity, and 46,200 gal/day at full capacity. The effectiveness of these measures has proven to be less than effective in preventing spills - for example, Olympic's leak detection system did not detect the 160,000 gallon Cedar River spill. Spill volumes of that magnitude which go undetected can have a serious impact on small streams (1 cfs) where resident trout and coho can frequently be found. **Exh. KDN-1 §§ 5.02 - 5 .03 at 16 et seq**.

Olympic's leak detection system will not prevent significant impacts to fish and aquatic resources from slow leaks, which can go undetected for long periods of time. Olympic concludes that slow leaks to the "dynamic" aquatic environment will only lead to short term significant impacts. However, the "dynamic nature" of the aquatic environment increases dispersal and mixing which could increase the concentrations of soluble fractions in water, resulting in higher toxicity. Olympic's assessment ignores the variability of conditions along the pipeline route, which can have a significant effect on spill duration, extent, and effect. **Exh. KDN-1 § 5.02 at 18**.

A slow leak occurred in the Yellowstone Pipeline, a petroleum products pipeline formerly running through the Flathead Indian Reservation. The leak was discovered in January of 1993 near Camas Creek, Montana, and went undetected for approximately 45 days. Not only was the leak small enough that a leak detection system would not have discovered it, but visual inspections (inspections similar to those proposed by Olympic) also did not discover it. **Exh. KDN-1 § 5.04 at 20**.

The effectiveness of a remote pipeline leak detection system also has human limitations. Human error in data interpretation can occur which may allow low level leaks to go undetected. Heavy reliance is also placed on visual inspections that occur every two weeks by aerial surveillance. The effectiveness of the visual inspections by air along a pipeline is uncertain. Aerial surveillance will only detect the largest spills.

Petroleum leaks in small streams can be devastating, as was found in the Camas Creek case study. Aquatic resources are still recovering 5 years after the spill. If a spill occurs in a small stream with resident trout, several age classes of trout will be affected. **Exh. KDN-1 § 5.04 at 20**.

If a sufficiently large segment of the fish population is destroyed, the population may take several years to recover to pre-spill population levels, especially if immigration by individuals from other areas to the stream is infrequent or rare. If a spill were to take place in Griffin Creek during the winter, significant mortality to coho eggs and juveniles, several age classes of trout, and potentially four age classes of steelhead (i.e. adults, eggs, one and two year olds), would occur. **Exh. KDN-1 § 5.02 at 19**.

Because of the lack of information as to pipeline spill risks in the Revised Application, the presence of fish and aquatic resources and their sensitivity, and the chronic effects of a petroleum spill, a conservative approach to pipeline construction and operation is warranted. Such an approach would incorporate redundant leak detection capabilities, pipeline construction characteristics that prevent rupture or leakage, minimized volumes spilled, avoids sensitive resources, and crosses areas that are easily accessible.

Q: Does Olympic adequately describe the toxicological impacts to fish and aquatic resources from a petroleum products spill?

A: No. The Revised Application fails to provide meaningful analysis on the toxicological effects (acute or chronic) of petroleum product releases on fish or other aquatic resources. Acute toxicity levels to fish are not described in the Revised Application. The refined petroleum products carried by the pipeline are toxic and the water soluble fraction of these products is highly toxic. **Joint Ecological Toxicology Report.** Acute toxicity levels for salmon and trout varies, but probably falls between 2.7 ppm and 50 ppm. Acute toxicity to invertebrates and algae from petroleum products also varies, from approximately 6.6 ppm to 50 ppm.. **Exh. KDN-1 § 5.03.01 at 19**.

Chronic effects are also not described in the Revised Application. Chronic exposure of fish to lower amounts of refined product can affect growth, swimming ability, and morphological effects, leading to latent mortality. Studies have reported a concentration of 39 ppb adversely affecting growth fish physiology. Sublethal concentrations for cutthroat trout range between 24 - 39 ppb. These results can and do occur in small and

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large pipeline spills, resulting in fish kills. For example, concentrations reported for a petroleum product spill in Camas Creek, on the Flathead Indian Reservation, fell within the sub-lethal range a day after the spill was detected, and occurred for weeks and months after the spill. A fish kill reported on Camas Creek three months after the spill could very well have been the result of chronic exposure. **Exh. KDN-1 § 5.03.02 at 19.**

Q: Please summarize the Camas Creek spill referred to above.

A: I am familiar with the petroleum product spill that occurred in Camas Creek, Montana, from the Yellowstone Pipeline. I personally visited the site in fall 1998, interviewed Confederated Salish and Kootenai Tribes' staff, and reviewed monitoring and natural resource damage assessment reports associated with this spill. **Exh. KDN-1 § 5.04 at 20**. On January 14, 1993 a leak in the Yellowstone Pipeline owned and operated by Conoco was discovered on the Flathead Indian Reservation. A release occurred consisting of a combination of gasoline, and jet and diesel fuels into Camas Creek, Montana. Approximately 30-72 barrels of fuel were released, and the spill was carried downstream for several miles. Camas Creek in the vicinity of the spill site has a gradient of approximately 2%. The stream varies from confined to unconfined and has annual daily discharge of approximately 1 to 2 cfs. The stream substrate is cobble, gravel, sand, and silt. The upper two miles of Camas Creek from where the spill occurred was estimated to support as many as 1470 cutthroat trout. A substantial portion of this habitat was negatively impacted from the spill. Aquatic invertebrates, a major food source, were eliminated or reduced in the stream for approximately one mile. The loss of riparian vegetation, a major source of detrital materials utilized by aquatic invertebrates was also reduced. Post spill monitoring in June of 1993 found few cutthroat in the contaminated reach. A fish kill in a pond adjacent to Camas Creek was reported by tribal biologists on March 24, 1993. The pond was located more than a mile downstream of the spill. Between 256 and 392 westslope cutthroat and redside shiners were recovered. Tissue samples showed high concentrations of aromatic hydrocarbons indicating petroleum contamination. The westslope cutthroat trout at the site was an isolated population. The kill raised a concern that the remaining population may be too small to maintain the genetic diversity within the population leading to an eventual loss of the population. **Exh. KDN-1 § 5.04 at 20**.

Five years after the spill, Camas Creek is still recovering. Key findings from 1997 monitoring found the macro-invertebrate community <u>approaching</u> full recovery, petroleum hydrocarbons detected in 1 of 11 domestic well samples, and in 6 of the 23 samples taken from 5 groundwater monitoring wells, and the presence of petroleum hydrocarbon in streambank sediments. The petroleum constituents found in the groundwater wells and the domestic well were all below drinking water standards. During my site visit in 1998 petroleum products were still being released from bank sediments. I personally witnessed rainbow sheens on the water, and a lack of aquatic invertebrates, which normally adhere to the underside of river cobble. **Exh. KDN-1 § 5.04 at 20**.

Q: What conclusions do you draw from the Camas Creek case study regarding the toxic effect on fish and habitat from a petroleum product spill from the proposed Cross-Cascade Pipeline?

A: The Camas Creek case study has direct application to impacts that can be expected from a petroleum products spill along the proposed Cross-Cascade pipeline. Using Camas Creek as a case study provides insights on the impacts to fish and aquatic resources involving a small leak in a small stream. Olympic would characterize a Camas Creek-type spill as significant only in the "short term". However, in my opinion, the results suggest otherwise at Camas Creek, where aquatic resources are still recovering after 5 years. Comparison to a Cross-Cascade pipeline spill in western Washington is appropriate. Camas Creek is similar to many small streams crossed by the proposed pipeline. The product spilled is similar to the product that will be transported by Olympic. The aquatic resources in Camas Creek are similar to aquatic resources found in streams in Washington. The location of the Camas Creek spill was remote, similar to many areas of the proposed pipeline. Finally, and perhaps most significant, is the comparison between Conoco's visual monitoring and the visual monitoring proposed by Olympic. The impacts from the spill confirm my opinion that a petroleum product spill can have a significant impact on fish resources, and may not be short in duration or limited in extent. **Exh. KDN-1 § 5.04 at 20**.

Q: What conclusions do you draw from the Tolt River Spill scenario prepared by CCA for this case, regarding the effect on fish and habitat?

A: If petroleum product concentrations reached the Tolt River as described in **Cascade Columbia Alliance - Spill Scenario - Tolt River (1999)**, significant mortality levels can be expected for all salmon and trout species and macro-invertebrates within the Tolt River and in significant reaches of the Snoqualmie River. In that scenario, diesel concentration in the Tolt River was assumed to be 1658 mg/l at scenario location, and 245 mg/l in the Snoqualmie River, at a point located 2.5 miles downstream. Both concentrations substantially exceed the high end acute toxicity levels reported for rainbow trout, as reported in my testimony above. Because of the high river velocities (2 – 3 ft/sec) in the Tolt River and Snoqualmie River, the diesel spill would be dispersed over several miles - potentially causing an extensive fish kill. **Exh. KDN-1 § 5.05 at 21.** During October in the Tolt River, adult chinook are actively spawning and, in odd years, pink salmon may be spawning as well. Adult steelhead will be holding in pools, yearling steelhead will be in pools and riffles, and steelhead fry will be inhabiting the margin of the river channel. Subyearling coho will be present and a few subyearling chinook. Cutthroat adults and juveniles will also be present. If petroleum spill occurred and the diesel concentrations reached the level estimated in the Tolt River scenario, most or all of the salmon and trout within the lower 2.5 miles of the Tolt River would be killed or would avoid the product by moving downstream into the Snoqualmie River. However, because of low flow conditions, movement by fish within the Tolt River may be restricted making avoidance more difficult. The chinook eggs and developing embryos in the constructed redds more than likely would suffer very high mortality. Some individuals not immediately killed by the diesel may die later from the sublethal physiological effects. **Exh. KDN-1 § 5.05 at 22**.

Diesel concentrations in the Snoqualmie River (245 mg/l) would lead to salmon mortality there as well. However, because size, depth, uneven mixing, and flow patterns it is unlikely the mortality levels would be as severe. It is likely that the depth and width of the Snoqualmie River would provide a means of escape for some adult and larger juveniles. Chinook embryos and other salmonid fry may still suffer significant mortality because of their higher sensitivity and lack of mobility. In addition, the higher levels of fine sediment and organics in the Snoqualmie River provide a medium for toxic components of diesel fuel to adhere to. Such a scenario suggests a condition where sublethal concentrations may persist, leading to latent mortality. Latent mortality could also occur from the loss of food organisms that were destroyed during the spill. **Exh. KDN-1 § 5.05 at 21.**

Any reduction in the survival of chinook and other salmonids (e.g. steelhead, coho, and cutthroat) would be felt over several cycles of that year class. In other words, chinook fry that emerge from a redd, and survive to maturity, will return to spawn as two year olds, some will return to spawn as three year olds, four year olds, and five year olds. A reduction in the number of returning adults in subsequent years could perpetuate the reduction. A petroleum product spill during odd years when pink salmon spawn would be particularly devastating. Pink salmon return only as two year olds, no overlap of year classes occurs, a reduction in population size caused by a petroleum spill would last for a significantly longer period. The mortalities caused by the spill would eventually be felt in the harvest of adults. **Exh. KDN-1 § 5.05 at 22.**

Q: What conclusions do you draw from the Tolt River Spill scenario regarding the effect on chinook production and harvest?

A: The spill would have a significant economic and cultural loss to tribal, sport, and nontribal commercial fisherman. It would also result in a lower future chinook escapement for three years or longer. Based on the calculations in my technical report, the petroleum spill would result in 1470 fewer chinook reaching the Terminal Area Fishery and spawning grounds over a three year period. A reduction in the number of returning adults would perpetuate the decrease over an indefinite number of cycles. **Exh. KDN-1 § 5.06 at 22**.

The impacts from the Tolt River spill scenario focused on chinook, specifically chinook eggs or embryos. If a spill occurred, mortality to yearling chinook, steelhead fry and yearlings, and coho fry are also likely. If the spill occurred on an odd year, pink salmon embryos would also be affected. All four species are harvested or could potentially be harvested by sport and commercial fisherman. The impacts to commercial and recreational fishermen are much broader than described in the example. **Exh. KDN-1 § 5.06 at 22**.

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Q: ***The National Marine Fisheries Service has proposed the Puget Sound wild chinook salmon for listing under the federal Endangered Species Act. Please describe the distribution of chinook salmon within the project area.***

A: Chinook salmon in the Snohomish Basin have been proposed for listing under the ESA as threatened. The chinook stock within the Snoqualmie River project area is the Snohomish fall chinook. Their distribution includes the Snoqualmie River, Sultan River, Pilchuck River, Woods Creek, and Elwell Creek. Approximately 75% of the fall chinook escapement spawns in the Snoqualmie drainage. A disproportionately high number of fall chinook juveniles rear for a year within the Snoqualmie River. **Exh. KDN-1 § 2.01.01 at 3**.

Q: ***What are the principal rearing and spawning areas utilized by Puget Sound wild chinook?***

A: Within the Snoqualmie River, fall chinook principally rear in the Snoqualmie River from Snoqualmie Falls to the confluence with the Skykomish River. The principal spawning areas for fall chinook in the Snoqualmie River are found between river mile 34 and 40, from river mile 22 to river mile 25, the lower 5 miles of the Raging River, and lower 6 miles of the Tolt River. **Exh. KDN-1 § 2.01.01 at 3**.

Q: ***Does Olympic adequately describe the impacts to Puget Sound wild chinook from the proposed pipeline project?***

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A: Absolutely not. In fact, Olympic mentions that <u>none</u> of the stream crossings in the project area present any impacts to spawning areas used by wild Puget Sound chinook salmon populations. Olympic couldn't be more incorrect. Chinook spawn at the Tolt River crossing and possibly at the Cherry and Griffin Creek crossings. Operational impacts pose a serious risk to the portion of the spawning population that use the Tolt River at and downstream of the crossing, including the Snoqualmie. Pipeline spills along the major stream crossings downstream of the Tokul Creek pose a serious threat to fall chinook. **Exh. KDN-1 § 2.01.01 at 3-4.**

Q: Does Olympic adequately describe the cumulative effects of the pipeline project on fish and habitat?

A: No. The Revised Application contains no meaningful discussion on the cumulative effects of the pipeline. Assessment of cumulative effects is very important. The production of fines from construction may have a far more serious effect if a stream system already has a high level of fines, and production is already limited by sedimentation. The relative impact of pipeline construction or a spill becomes more severe in a watershed if resources are depressed or habitat conditions as a whole are degraded. Construction or operational impacts can have a far more significant impact if they occur in major salmon production areas. **Exh. KDN-1 § 3.02 at 7.**.

In four sub-basins in the Snoqualmie Basin, watershed analyses have been conducted: Tolt (1993), Griffin, and Tokul Creek (1995), and the South Fork Snoqualmie (1995). In these specific sub-basins Olympic could potentially have assessed whether impacts from the pipeline would have, along with other land uses, had a significant cumulative impact on fish and aquatic resources. Watershed analysis results describe the current overall condition of the watershed, as well as conditions (i.e. locations of unstable slopes, high erosion) within specific areas of the watershed. Watershed analysis results also determine the types of land management actions that are allowed by area of the basin. Watershed analysis information would have been useful in locating a pipeline route. Information generated by the analyses was never referenced in the CCP Application. In addition to the results, methods described in the analyses to evaluate stream channels, fish habitat, and upslope conditions would have been useful to Olympic for assessing other areas along the pipeline corridor. **Exh. KDN-1 § 2 at 2.**

Q: ***Do you consider Olympic's proposed mitigation to adequately protect fish and habitat?***

A: No. The first problem is that the Revised Application does not clearly set forth Olympic's proposed mitigation measures, which appear dispersed throughout the document. **Exh. KDN-1 § 3.01 at 6.** Mitigation measures should be directed to address both construction and operation impacts. As to construction mitigation, the effectiveness or success of the erosion control measures will depend to a significant degree on crossing methods, construction detail, fish and aquatic resources present, and local site conditions. If the site conditions are unknown, effectiveness of mitigation cannot be reasonably anticipated. At some locations, the construction impacts to the affected fishery resource can best be mitigated by avoidance. Alternative stream crossing locations or methods (i.e., bridged crossings or horizontal directional drills) are strongly recommended for Cherry Creek, Harris Creek, Griffin Creek, and Tolt River crossings. **Exh. KDN-1 § 6 at 22-23.**

Q: ***What if any additional mitigation measures would you consider appropriate?***

A: In addition to many of the mitigation measures suggested by Olympic, EFSEC, the US Forest Service, and other state and federal agencies, the following additional mitigation measures should be required or modified:

<u>Construction Mitigation</u>*:*

- The construction window should be stream specific.

- Trees should be planted along the stream corridor in addition to Olympic's proposed revegetation. The pipeline will be well below rooting depth. Aerial and ground reconnaissance can still take place.
- The glacial till materials commonly found within the Snoqualmie Basin generate much fine sediment. Traditional means to remove fine sediment will not work. More elaborate filtration procedures will be required.
- At all stream crossings, fish should be removed before construction begins.
- The withdrawal and discharge of hydrostatic testing water should not be allowed in small streams. Sources of water and discharge points should be the three sources and discharge points discussed in **RA § 2.5**.
- Stream habitat degraded by pipeline construction should be replaced at a minimum of a 2:1 ratio.
- All culverts that are undersized (based on a 100 to 200 year event) are blockages or are in poor condition and should be replaced.
- Site specific construction plans should be required <u>prior to certification</u> for stream crossings that contain salmon and trout, or at stream crossings where salmon or trout can be found just downstream, as well as at crossings that are sensitive to mass wasting potential and scour. This should be a standard procedure and not considered a mitigation measure.
- The design of site specific crossing plans and mitigation measures should be coordinated through co-managers of the fishery - state, tribal, and federal resource

agencies. Coordination with the Tulalip Tribes should specifically be required for stream crossings in the Snohomish and Snoqualmie rivers.

- Riparian losses should be mitigated through the purchase and restoration of streambanks at another location in at least a 2:1 ratio.
- More accurate description of stream crossing conditions, fish utilization, nearest fish population, slopes, bed control points, valley wall stability, must be reported.
- Approaches to stream crossings should be spanned or matted to reduce impacts to the riparian areas and stream banks.
- Concrete coated pipe should be required at all stream crossings and should extend across floodplains.
- Water that leaves the site should filtered to the point that it does not exceed water quality standards for turbidity. This should be a water quality permit requirement.
- Additional block valves be added in the vicinity of mile post 17, 20, 27.
- A second leak detection system should be designed into the system to provide an additional factor of safety. For instance, adding hydrocarbon sensing along the pipeline route or portions of the route that cross sensitive areas.

If implemented, these mitigation measures will reduce but not eliminate the substantial risk of impact to salmon resources from construction activities.

Operation and Maintenance Mitigation. According to the Revised Application, prevention of impacts during the pipeline operation relies to a significant degree on monitoring. However, monitoring has its limitations. First of all, a monitoring plan must be specific as to the type of monitoring to be used, its data-gathering and reporting techniques, and its goals and objectives. Second, simply inspecting a pipeline crossing to insure problems will be corrected is inadequate. Problems at stream crossings may not happen in a manner that is detectable by monitoring. Monitoring will not mitigate problems that arise quickly and catastrophically. The following additional mitigation measures are proposed for operation and maintenance, to address impacts to fish and habitat:

- The pipeline should be hydrostatically tested in sensitive areas every 2 years.
- The pipeline should be tested annually using ultrasonic "smart pigs."
- Scour monitoring using relocatable cross sections and/or scour chains.
- The pipeline should be inspected on a weekly basis by walkiing.
- Inspectors should be equipped with hydrocarbon monitoring devices.
- Independent oversight during construction and operation should be required.

Even these mitigation measures will not completely eliminate the significant risk of a release to salmon streams. See CCA (1999) (Mastandrea Risk Report).

Q: Please state your overall conclusions with respect to the impacts to western Washington fish and habitat from pipeline construction, operation and maintenance.

A: The Revised Application does not present a complete and accurate description of fish and aquatic resources present within the Snohomish/Snoqualmie Basin. The Revised Application does not provide enough information on the resources and site condition present at stream crossings to meaningfully evaluate project impacts. The Revised Application does not present a complete picture of the potential types, severity, or magnitude of construction or operational impacts, including but not limited to its description of the risk of spills. The organization of the Revised Application makes it cumbersome and difficult to evaluate the impacts of the proposed project on fisheries resources, and proposed mitigation measures. Potential impacts to fish and aquatic resources are discussed in several sections, making review quite cumbersome. However, more importantly the organization of the document splits up the assessment of impacts so that each are evaluated independently, indirectly minimizing the level of impact to a resource. Pipeline impacts in one section are not clearly conveyed to other relevant sections. The Revised Application does not attempt to discuss cumulative effects nor does the Revised Application provide meaningful discussion on spill related toxicological impacts. As a result, the proposed project appears to have a minimal impact on fish and aquatic resources when in fact impacts can and will be far more severe than the proposal indicates.

The Revised Application does not present a clear picture of the types of mass wasting processes present within western Washington and their proximity to, and effects on, fish and aquatic resources. Mass wasting poses a significant threat to the pipeline and associated fish and aquatic resources. The proposed pipeline route is located on two or more deep-seated failures and crosses more than a dozen streams that are prone to debris torrents. Olympic Pipeline has not shown that a pipeline can be constructed in these locations without major impacts to fish and aquatic resources.

Chinook salmon in the Snoqualmie Basin have been proposed for listing in the coming year. Thousands of dollars are currently being spent to generate a salmon recovery plan.

In the future hundreds of thousands or possibly millions of dollars will be spent on chinook salmon recovery. We find it ironic that at the same time recovery planning is occurring, an additional threat and additional impacts to chinook salmon are seriously being considered.

END OF DIRECT TESTIMONY

Executed this ________ day of February, 1999.

____
Kurt D. Nelson